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(54) **INTEGRATING MAPS AND STREET VIEWS**

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3/04847* (2013.01); *G06T 3/00* (2013.01);
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None
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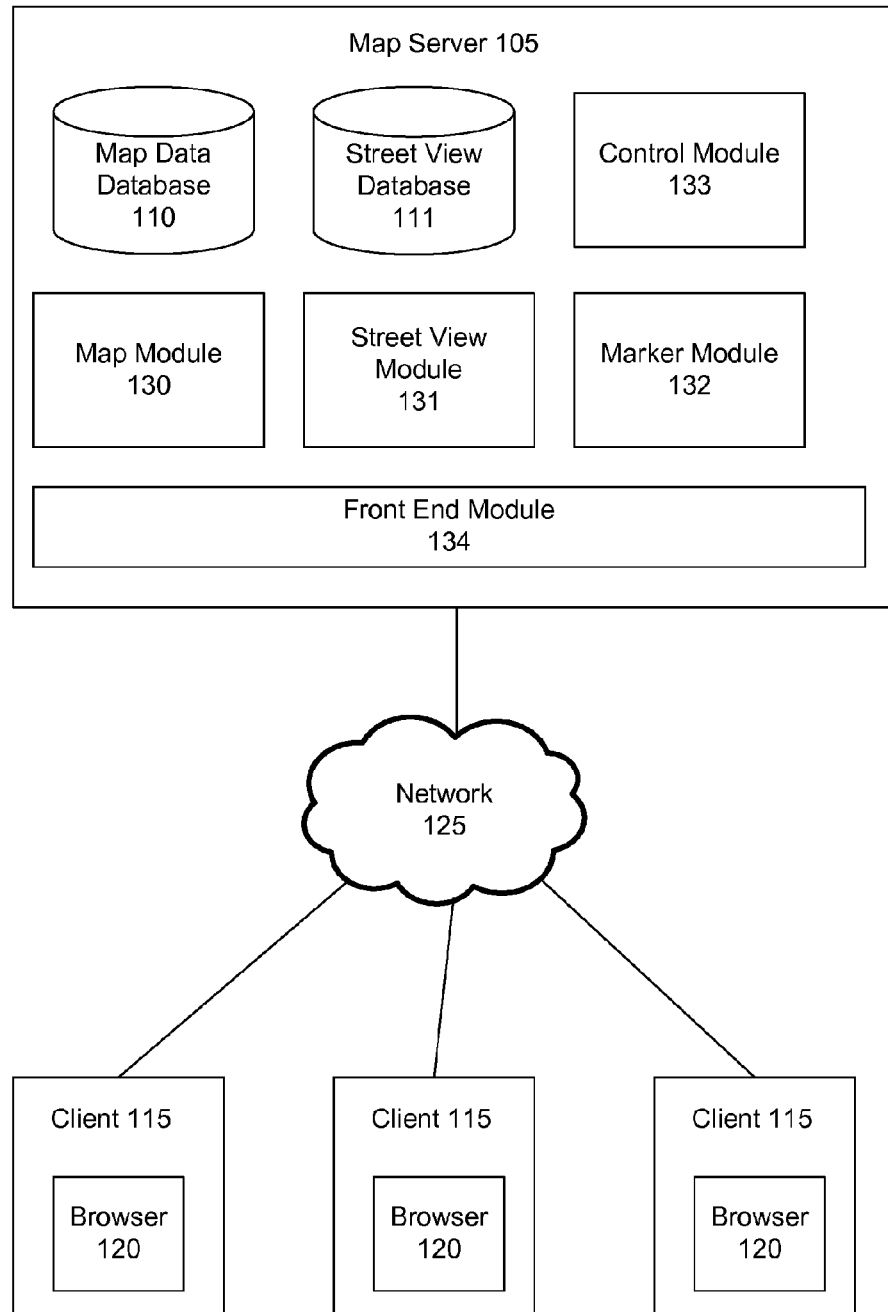(74) *Attorney, Agent, or Firm* — Fenwick & West LLP
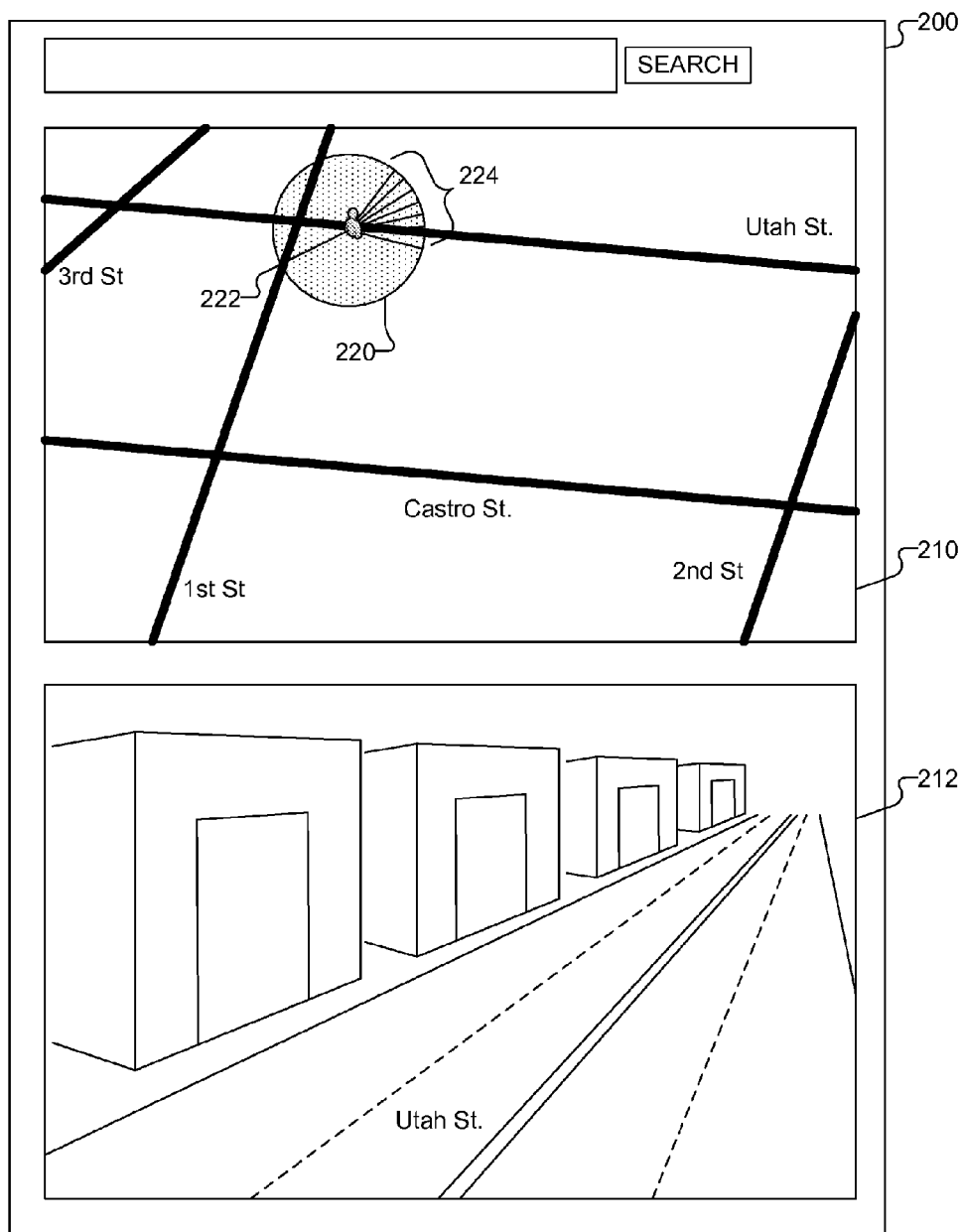
(57) **ABSTRACT**

Methods and systems for improved integration of an over-
head representation (e.g., a map) with a street view represen-
tation. A user interface with at least two regions is output for
display to a user. One region includes an overhead represen-
tation of an area and an interactive control overlaid onto the
overhead representation. Another region includes a street
view perspective that has a point of view corresponding to a
position and directional orientation of the interactive control.
Information about a user input that adjusts the interactive
control is received and the street view perspective is updated
to track the control as it is adjusted. The field of view of the
street view perspective may be reflected in the appearance of
the interactive control. Additionally, the street view perspec-
tive may follow the location of a marker as it is moved around
the overhead representation.
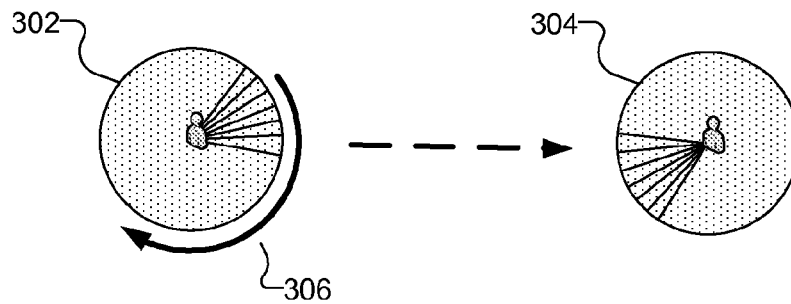
21 Claims, 6 Drawing Sheets
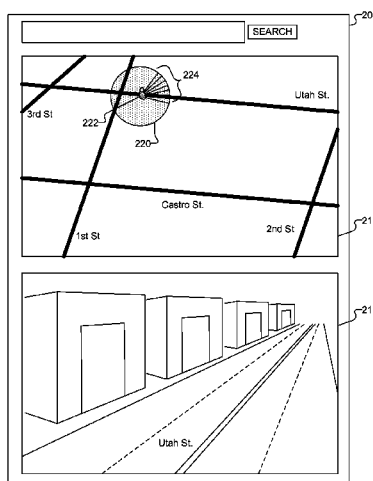
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G06F 3/0484	(2013.01)	
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CPC .. *G01C 21/3647* (2013.01); *G06F 2203/04803*
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Map Server 105

Map Data Database 110

Street View Database 111

Control Module 133

Map Module 130

Street View Module 131

Marker Module 132

Front End Module 134

Network 125

Client 115

Browser 120

Client 115

Browser 120

Client 115

Browser 120

FIG. 1

FIG. 2

302

304

306

FIG. 3A

314

Utah St.

3rd St

310

312

1st St

Castro St.

2nd St

FIG. 3B

FIG. 4

Display user interface that includes an
overhead representation, street view
perspective, and interactive control
505

Receive information about user input
that adjusts the interactive control
510

Update street view perspective to track
control
515

FIG. 5

Display user interface that includes an
overhead representation, street view
perspective, and marker
605

Receive information about user input
adjusting the marker
610

Update street view perspective to track
marker
615

FIG. 6

INTEGRATING MAPS AND STREET VIEWS

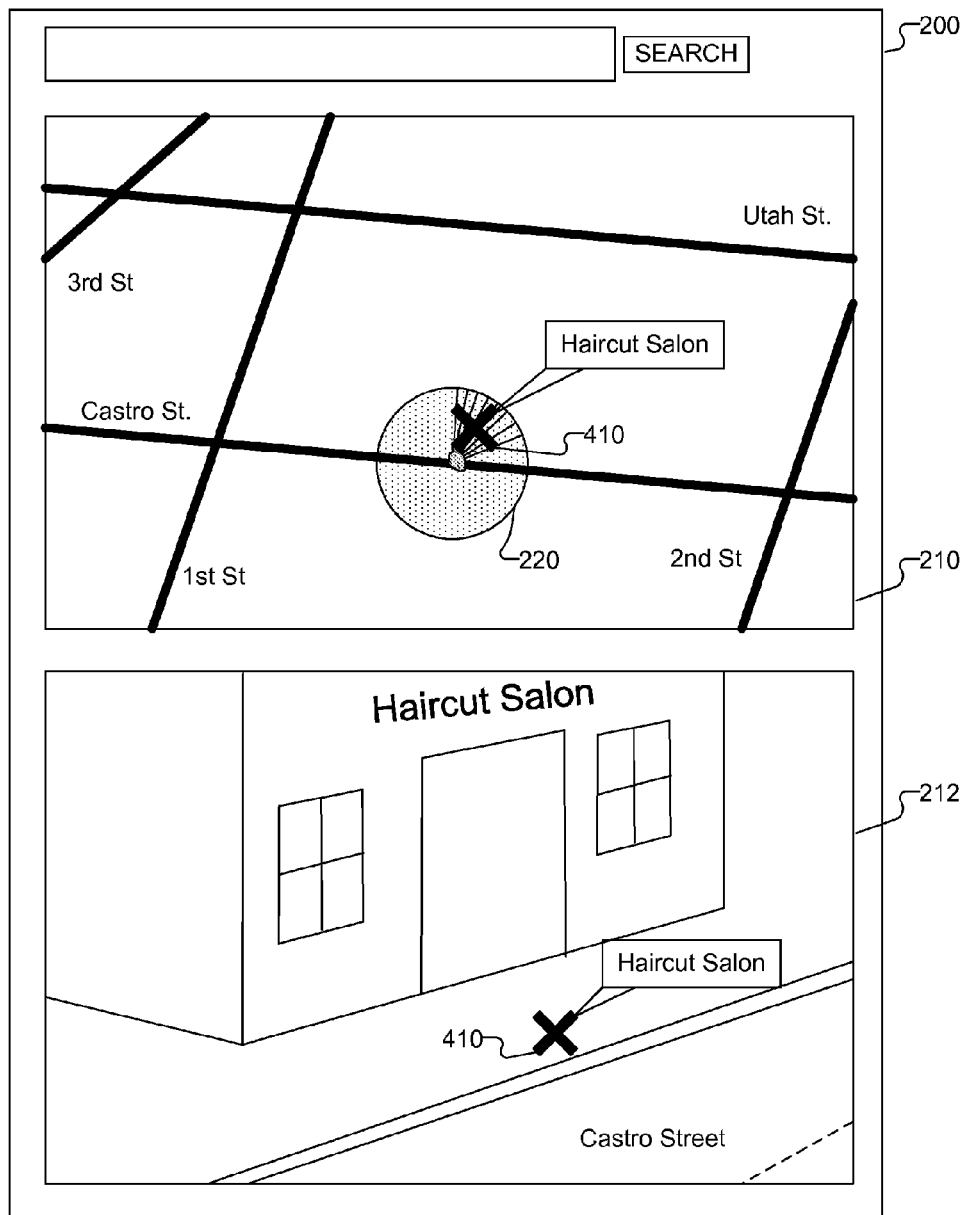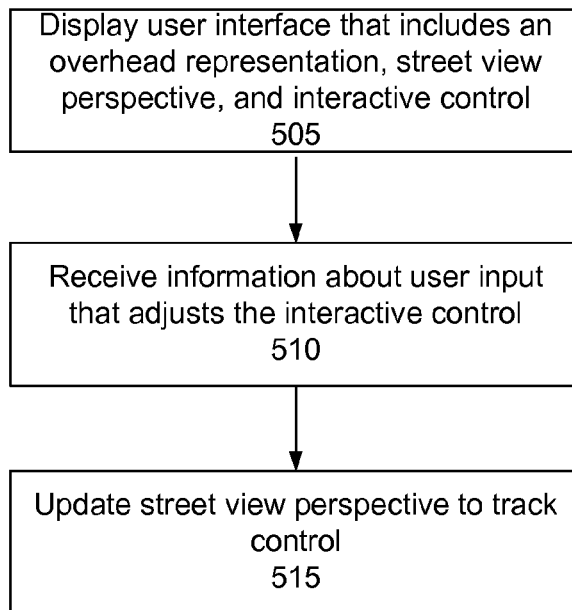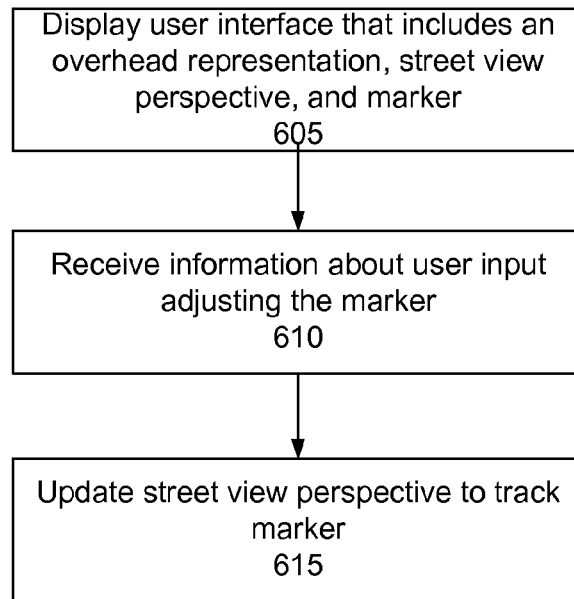## CROSS REFERENCE TO RELATED APPLICATIONS

This application claims priority under 35 U.S.C. §119 from Indian Patent Application No. 1287/CHE/2011, entitled "Integrated Maps and Street Views," filed on Apr. 12, 2011, the subject matter of which is incorporated by reference herein in its entirety.

FIELD OF THE DISCLOSURE

Described embodiments relate generally to digital maps, and more specifically to integrating digital maps with street views.

BACKGROUND

Digital maps are used by a wide variety of devices, including car navigation systems, hand-held GPS units and mobile phones, and are also used by many websites. Most devices display digital maps using some form of an overhead view, such as a cylindrical projection (e.g., Mercator), or a "bird's eye" view, providing an overhead view with perspective. Recently, some websites, such as GOOGLE MAPS, have added "street view" features to their maps. A street view is a visualization from a point of view that is near ground level (e.g., from a camera mounted on top of a vehicle). The street view may be generated from photographs taken at many different locations throughout the world, generated using three-dimensional graphics, or a combination thereof. A street level view provides a first-person type perspective of the world that is not otherwise available from an overhead view of a map. However, navigating through a street level view can be a slow and disorienting experience that prevents users from making efficient use of the additional information that is available in the street views.

SUMMARY

Described embodiments provide methods and systems for integrating an overhead representation of an area (e.g., a street map) with a street view perspective of the area. In one embodiment, a user interface has at least two regions that are output for display. An overhead representation of an area is displayed in a first region of the interface display. For example, the overhead representation may be a street map. The first region of the user interface display also includes an interactive control that has a position and a directional orientation in the overhead representation. A street view perspective of the area is displayed in a second region of the user interface display concurrently with the first region. The interactive control is synchronized with the street view perspective such that the point of view shown in the street view perspective corresponds to the position and directional orientation of the interactive control. Information about a user input that adjusts (e.g., by rotating, dragging, or tilting) the interactive control is received. In response, the street view perspective is updated to track the orientation or position of the control as it changes.

In some embodiments, the field of view of the street view perspective is reflected in the appearance of the interactive control. For example, the field of view may be indicated by a view cone in the interactive control. In other embodiments, a marker in the first region that represents a feature (e.g., restaurant or business) can be moved (e.g., dragged) to a differ-

ent location in the overhead representation. As the marker is moved, the street view perspective is updated to track the location of the marker. These features provide a more user-friendly experience when navigating or editing maps in conjunction with a street view perspective.

The features and advantages described in this summary and the following detailed description are not all-inclusive. Many additional features and advantages will be apparent to one of ordinary skill in the art in view of the drawings, specification, and claims hereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is block diagram of a computing environment for a map system according to one embodiment.

FIG. 2 is a user interface for integrating a map with a street view according to one embodiment.

FIG. 3A illustrates rotating an interactive control according to an embodiment.

FIG. 3B illustrates dragging an interactive control according to an embodiment.

FIG. 4 is a user interface for integrating a map with a street view according to one embodiment.

FIG. 5 is a method for integrating a map with a street view according to one embodiment.

FIG. 6 is a method for integrating a map with a street view according to one embodiment.

The figures depict a preferred embodiment of the present disclosure for purposes of illustration only. One skilled in the art will readily recognize from the following discussion that alternative embodiments of the structures and methods illustrated herein may be employed without departing from the principles of the disclosure described herein.

DETAILED DESCRIPTION

System Overview

FIG. 1 is a block diagram that illustrates a computing environment for a map system, according to one embodiment. As shown in FIG. 1, the computing environment includes a map server 105 connected to a number of clients 115 through a network 125. The map server 105 includes functionality for integrating a map with a street view. The map server 105 generates a user interface that includes one region for displaying a map and another region for displaying a street view. In one embodiment, an interactive control on the map is used to control the perspective of the street view. In some embodiments, a field of view of the street view is represented in the appearance of the interactive control. In other embodiments, the street view tracks the position of a marker on the map as the marker is moved around the map.

Through the specification, various embodiments are described by reference to street maps and street level views for purposes of clarity. However, the principles described herein are applicable to any user interface that integrates an overhead representation with a street view perspective. For example, a street map is just one example of an overhead representation, and a street level view is just one example of a street view perspective. In other embodiments, for example, the overhead representation may be a floor plan for a building and the street view perspective may be an interior view of the building from a specific location in the floor plan.

In one embodiment, the map server 105 is implemented as a server class computer comprising a CPU, memory, network interface, peripheral interfaces, and other well known components. As is known to one skilled in the art, other types of computers can be used which have different architectures.

The server **105** can be implemented on either a single computer, or using multiple computers networked together. The server **105** is also adapted to execute computer program modules for providing functionality described herein. As used herein, the term "module" refers to computer program logic used to provide the specified functionality. Thus, a module can be implemented in hardware, firmware, and/or software. In one embodiment, program modules are stored in a non-transitory computer-readable storage medium (e.g. RAM, hard disk, or optical/magnetic media) and executed by a processor or can be provided from computer program products that are stored in non-transitory computer-readable storage mediums.

As shown in FIG. **1**, the map server **105** includes a map data database **110**, a street view data base **111**, a front end module **132**, a map module **130**, and a street view module **131**. In general, functions described in one embodiment as being performed on the server side can also be performed on the client side in other embodiments if appropriate. In addition, the functionality attributed to a particular component can be performed by different or multiple components operating together.

The map data database **110** includes map data for features (e.g., roads, parks, bodies of water, buildings, restaurants, hospitals, businesses) that can be used to generate a digital map. For example, the map data may include location information (e.g., GPS coordinates, latitude and longitude) and other attribute information (e.g., name, size, shape) for various features. The street view database **111** includes images of a variety of locations at points of view at approximately street level (e.g., near the height of a human observer). Each image is associated with a geographical location (e.g., GPS coordinates, etc) and a directional orientation so that 360-degree panoramic views can be created from sets of images. The street view images can include actual photographs or still images captured at many geographical locations throughout the world. For example, the images may have been captured with a vehicle-mounted camera that is elevated above the ground. The street view images can also include computer generated renderings, using 3D modeling techniques, as well as analysis and integration of photographs. Images may exist only for discrete points in the world such that not all points of view can be re-created.

A map data database **110** and street view database **111** are illustrated as being stored in server **105**. Alternatively, many other configurations are possible. The database **110** and **111** do not need to be physically located within server **105**. For example, the databases can be stored in a client **115**, in external storage attached to server **105**, or in network attached storage. Additionally, there may be multiple servers **105** that connect to a single database **110** or **111**.

The map module **130** accesses the map data stored in the map data database **110** to generate a map. A map is a visual representation of a particular area of the world as viewed from an overhead viewpoint. The map may be a two-dimensional (2D) representation, a two and a half dimensional (2.5D) representation or a three dimensional (3D) representation. Additionally, the map may include features such as roads, buildings, businesses, other features that are commonly shown on maps.

The control module **133** generates an interactive control, which is a visual indicator that can be overlaid onto the map. The interactive control has a position and orientation that can be adjusted by a user of the client **115** that interacts with the map. The interactive control is operable to synchronize the map generated by the map module **130** with the street view generated by the street view module **131**, as explained below

in conjunction with FIG. **2-3**, and thereby helps to provide a real time integration of the map with a street view. In some embodiments, the appearance of the interactive control is modified to graphically illustrate the field of view shown in the street view.

The marker module **132** generates markers, which are a type of interactive visual indicator. Markers represent specific features in the map and may be overlaid on the map and/or street view. For example, the position of a marker may represent the location of a particular restaurant or business. Markers can be positioned by a user of a client **115** that interacts with the map, and markers are also synchronized with the street view generated by the street view module **131**. Markers are explained in conjunction with FIG. **4**.

The street view module **131** accesses the images in the street view database **111** to generate a street view for display in a street view window. The street view is synchronized to the position and orientation of the interactive control and/or the position of the marker. In one embodiment, the street view represents the point of view of a camera or person located in the real world at the position denoted by the interactive control that is facing in the direction denoted by the interactive control. When a user of the client **115** adjusts the interactive control or markers, the street view module **131** receives the changes and automatically updates the street view to reflect the appropriate changes.

The front end module **134** generates a user interface that includes at least two concurrently displayed regions: a region for the map and interactive control and another region for the street view. The regions may be, for example, different regions within the same window or separate windows within the same interface. The front end module **134** also handles communications with the client **115**. The front end module outputs the user interface (e.g. as HTML or other information) to the client device **134** for display to a user of the client **115** device. As used here, "displaying" is meant to include either direct or indirect display of information. The front end module **132** also receives user input information from the clients **115** that includes information about user inputs that search, navigate, or edit the map and street view. The user input information is relayed to the various modules (**130-133**) of the map server **105** for updating the maps, street views, interactive controls, and markers.

In one embodiment, a client **115** executing a browser **120** connects to the map server **105** via the network **125** to access a map and/or to make changes to features in the map. The network includes but is not limited to any combination of a LAN, MAN, WAN, mobile, wired or wireless network, a private network, or a virtual private network. While only three clients **115** are shown in FIG. **1**, in general very large numbers (e.g., millions) of clients **115** are supported and can be in communication with the map server **105** at any time. In one embodiment, the client **115** can be implemented using any of a variety of different computing devices, some examples of which are personal computers, digital assistants, personal digital assistants, cellular phones, mobile phones, smart phones and laptop computers.

The browser **120** may include any application that allows users of clients **115** to access web pages on the World Wide Web. Suitable applications include, but are not limited to GOOGLE CHROME, MICROSOFT INTERNET EXPLORER, NETSCAPE NAVIGATOR, MOZILLA FIRE-FOX, and APPLE SAFARI. The browser **120** is capable of displaying a map and receiving user inputs that navigate through or make changes to the map. Alternatively, the maps can be accessed by a standalone program separate from the

browser **120**, such as an ANDROID or IPHONE application that is designed for accessing maps.

The browser **120** allows a user of the client **115** to access and view maps and street views from the map server **105** via a user interface provided by the front end module **132**. Through the interface, a user can adjust the interactive control and markers with a user input such as a keyboard, mouse, or touch screen input. The user input is then provided to the map server **120** for updating the information displayed at the client **115** device.

Interface for Integrating Map View and Street View

FIG. **2** is a user interface **200** for integrating a map with a street view according to one embodiment. As shown, the user interface **200** includes a map view region **210** and a street view region **212** that are concurrently displayed as vertical split regions. In other embodiments the arrangement of the two regions may be different. For example, the regions may be of different sizes or shapes. As another example, in a preview mode, the street view region **212** may be displayed as a small preview region in a corner of a larger map view region **210**, and the user can switch between the preview mode and the split view mode.

The map view region **210** includes a 2D overhead view of several streets and their intersections. Other features that may also be displayed in the map of the map view region **210** include buildings, parks, restaurants, etc. (not shown). In other embodiments, the map view region may include other representations of a map, such 2.5D representation, a 3D representation, a terrain representation, or a satellite image.

The map view region **210** includes an interactive control **220** that is used to synchronize the map view region **210** with the street view region **212**. The interactive control is a visual indicator that has both a position and an orientation. The position of the interactive control **220** is indicated by a "pegman" **222**, an icon indicating the point of view for the street view region **212**, at the center of the interactive control **220**. For example, the interactive control **220** is shown here to be located on Utah St. The orientation of the interactive control **220** is indicated by the direction of the cone **224** extending from the pegman **222** at the center of the interactive control **220**. In other words, the cone **224** represents the direction in which the pegman **222** is looking. For example, the interactive control **220** is shown here to be oriented in a north-east direction towards the north side of Utah St. In other embodiments, the interactive control may have a different appearance than what is shown in FIG. **2**.

The street view region **212** includes a street level view that is synchronized with the interactive control **224** of the map view region **210**. Specifically, the visualization shown in the street view region **212** corresponds to the point of view as seen from the position of the pegman **222** in the direction in which the pegman **222** is facing. For example, the pegman **222** is located east of 1st street on Utah Street and faces to the north side of the Utah Street. Thus, the point of view of a person or camera located on Utah Street and facing the north side of Utah Street is shown in the street view region **212**.

The interface **200** is interactive and accepts inputs from a user for navigating the displayed map. Specifically, a user can interact with the interactive control **220** in at least two ways: by rotating the control **220** or dragging the control **220** to a new position. FIG. **3**A illustrates rotating an interactive control according to an embodiment. Interactive control **302** represents a control before it is rotated **306** and interactive control **304** represents the control after it is rotated **306**. A user can rotate the control **302**, for example, by selecting the cone of the interactive control **302** with a mouse or touch screen input and dragging the cone to a new orientation.

FIG. **3**B illustrates dragging an interactive control to a new position according to an embodiment. Interactive control **310** represents a control before it is dragged **314** and interactive control **312** represents the control after it is dragged **314**. A user can drag the control **310**, for example, by selecting the center or rim of the interactive control **310** with a mouse or touch screen input and dragging the control **310** across the map to a new position.

Referring back to FIG. **2**, as the interactive control **220** is being rotated to its new orientation and/or dragged to its new position, the street view region **212** is updated to track the orientation and position of the interactive control **220**. For example, if the interactive control **220** is rotated from its current orientation facing the north side of Utah St. towards the south side of Utah St., the street view region **212** would also pan from the north side of Utah St to the south side of Utah St to simulate the motion of a person turning their head from one side of the street to the other side of the street. As another example, if the interactive control **220** is dragged from its current position on the west end of Utah St. to the east end of Utah St., the street view region **212** would also follow the control **220** to simulate the motion of a person walking or driving down the street. By allowing a user to control the display of the street view region by rotating and dragging a control in the map view region, the user is provided with an intuitive navigational experience. As the control **220** is synchronized with the street view region **212**, any changes in the street view region **212** also cause the position and orientation of the control **220** to be updated.

In one embodiment, the interactive control **220** can also be tilted up and down which causes a corresponding change in the street view region **212**. Tilting the control **220** adds an additional vertical orientation dimension to the user interface **200**. For example, tilting the interactive control **220** up causes the image in the street view region **212** to tilt upwards towards the sky, simulating the motion of a person looking upwards. Tilting the control **220** down causes the image in the street view region **212** to tilt downwards towards the ground, simulating the motion of a person looking downwards. In one embodiment, the appearance of the interactive control **220** also changes to indicate that it is tilted. For example, the interactive control may appear tilted and have a shadow when the control is tilted.

The field of view of the perspective in the street view region **212** is also represented by the angular size of the view cone **224** of the interactive control **220**. A field of view may also be known as an angle of view, and refers to the part of the scene that is visible in the street view region **212**. For example, if the field of view in the street view region **212** is 60 degrees, then the size of the cone **224** is also approximately 60 degrees. The interactive control **220** may also be partially transparent so that the region of the map covered by the field of view is readily visible to a user. In one embodiment, the street view region **212** has a constrained field of view, such as a view of 45-60 degrees. In other embodiments, the street view region **212** may have a smaller or larger field of view. Representing the field of view in the appearance of the interactive control **220** helps the user maintain a sense of how the image in the street-view region **212** relates to features shown in the map view region **200** without becoming disoriented.

In one embodiment, features that are known to be in the field of view of the street view region **212** are projected onto the map view region **210**. Projecting features onto the map view region **210** can include marking the features, for example, in a visually distinctive manner such as highlighting or coloring. In one embodiment, features in the street view region **212** are identified from previously stored associations

between the street view images and certain features. For example, if a particular street view image is known to include a portion of the Empire State Building, then the Empire State Building will be highlighted in a distinctive color, outline, or other graphical attribute in the map view region **210**.

Referring now to FIG. **4**, illustrated is a user interface **200** for integrating a map view with a street view according to one embodiment. Specifically, FIG. **4** illustrates how a user can edit a map by adjusting the position of a marker in the map. The interface **200** in FIG. **4** is similar to the interface in FIG. **3**, but the interface now includes visual markers **410** in both the map view region **210** and the street view region **212**. Both visual markers **410** are linked to each other and represent the location of the business "Haircut Salon." A user can move the marker **410** around the map view region **210** to place the marker **410** in a new position, for example, to correct the location of the marker **410** if it is in the wrong place. The user input may be, for example, a mouse, or touch screen input that selects the marker **410** in the map view region **210** and drags it to a new location. As the marker **410** is being dragged around the map view region **210**, the perspective in the street view region **212** is updated to track the position of the marker **410**.

The street view region **212** may track the position of the marker **410** by showing how the marker **410** would appear from a street location that is closest to the marker. The street view region **212** also shows how the marker **410** would appear from the point of view of a person or camera facing the marker **410**. For example, if the marker **410** were moved in the map view region **210** from its position on Castro St. to a location on Utah St., the street view region **212** would also be updated to follow the marker **410** as it is dragged to its new location. Eventually, the street view region **212** would show the new location for the marker **410** on Utah St. as viewed from the closest point on Utah St. where an image is available. By following the location of the marker **410** in the street view region **212**, the user can quickly and accurately determine if the marker **410** is placed at the correct location by referring to the display in the street view region **212**.

In other embodiments, the marker **410** may have an appearance that is different from that shown in FIG. **4**. Additionally, the map view region **210** may include an interactive control **220** that was previously described in conjunction with FIG. **2**. As mentioned, the interactive control **220** is synchronized with the street view region **212**. When the street view region **212** follows the position of the marker **412**, the interactive control **220** is also updated to correctly reflect the perspective shown in the street view region **212**.

Process Flow

FIG. **5** illustrates a method for integrating an overhead representation (e.g., map view) with a street view perspective, according to an embodiment. In one embodiment, the steps in FIG. **5** may be performed by the various modules of the map server **105**. In step **505**, a user interface is displayed that is includes at least two regions. An overhead representation of an area is output for display in one region of a user interface. For example, the overhead representation may be a street map or a floor-plan for a building. An interactive control is also output for display in the same region of the user interface as the overhead representation. The interactive control has both a position and an orientation with respect to the overhead representation. A street view perspective of the area is output for display in another region of the user interface. The street view perspective represents the point of view from the position denoted by the interactive control in the direction denoted by the interactive control. The field of view of the

street view perspective may also be reflected in the appearance of in the interactive control, for example, with a partially transparent view cone.

In step **510**, information about a user input that adjusts the interactive control is received. For example the user input may adjust the interactive control by rotating, dragging, or tilting the control. In step **515**, the street view perspective is updated to track the changes to the interactive control. If the user input rotates or tilts the interactive control, the street view perspective is updated to track the orientation of the interactive control as the control is being rotated. If the user input drags the interactive control to a new position, the street view perspective is updated to track the position of the interactive control as the control is being moved.

FIG. **6** illustrates a method for integrating an overhead representation (e.g., map view) with a street view perspective, according to an embodiment. In step **605**, a user interface is displayed that includes at least two regions. An overhead representation and one or more markers are output for display in one region of the interface. A marker represents a feature in the overhead representation, for example, a restaurant or business. A street view perspective of the area is output for display in another region of the user interface. The street view perspective has a point of view that faces a position denoted by the visual marker. In step **610**, information about a user input that drags the marker around the overhead representation to a new position is received. As the marker is dragged to its new position, the street view perspective is updated to track the position of the marker as it is being moved.

Additional Configuration Considerations

Throughout this specification, plural instances may implement components, operations, or structures described as a single instance. Although individual operations of one or more methods are illustrated and described as separate operations, one or more of the individual operations may be performed concurrently, and nothing requires that the operations be performed in the order illustrated. Structures and functionality presented as separate components in example configurations may be implemented as a combined structure or component. Similarly, structures and functionality presented as a single component may be implemented as separate components. These and other variations, modifications, additions, and improvements fall within the scope of the subject matter herein.

Certain embodiments are described herein as including logic or a number of components, modules, or mechanisms. Modules may constitute either software modules (e.g., code embodied on a machine-readable medium or in a transmission signal) or hardware modules. A hardware module is tangible unit capable of performing certain operations and may be configured or arranged in a certain manner. In example embodiments, one or more computer systems (e.g., a standalone, client or server computer system) or one or more hardware modules of a computer system (e.g., a processor or a group of processors) may be configured by software (e.g., an application or application portion) as a hardware module that operates to perform certain operations as described herein.

In various embodiments, a hardware module may be implemented mechanically or electronically. For example, a hardware module may comprise dedicated circuitry or logic that is permanently configured (e.g., as a special-purpose processor, such as a field programmable gate array (FPGA) or an application-specific integrated circuit (ASIC)) to perform certain operations. A hardware module may also comprise programmable logic or circuitry (e.g., as encompassed within a general-purpose processor or other programmable proces-

sor) that is temporarily configured by software to perform certain operations. It will be appreciated that the decision to implement a hardware module mechanically, in dedicated and permanently configured circuitry, or in temporarily configured circuitry (e.g., configured by software) may be driven by cost and time considerations.

Accordingly, the term "hardware module" should be understood to encompass a tangible entity, be that an entity that is physically constructed, permanently configured (e.g., hardwired), or temporarily configured (e.g., programmed) to operate in a certain manner or to perform certain operations described herein. As used herein, "hardware-implemented module" refers to a hardware module. Considering embodiments in which hardware modules are temporarily configured (e.g., programmed), each of the hardware modules need not be configured or instantiated at any one instance in time. For example, where the hardware modules comprise a general-purpose processor configured using software, the general-purpose processor may be configured as respective different hardware modules at different times. Software may accordingly configure a processor, for example, to constitute a particular hardware module at one instance of time and to constitute a different hardware module at a different instance of time.

Hardware modules can provide information to, and receive information from, other hardware modules. Accordingly, the described hardware modules may be regarded as being communicatively coupled. Where multiple of such hardware modules exist contemporaneously, communications may be achieved through signal transmission (e.g., over appropriate circuits and buses) that connect the hardware modules. In embodiments in which multiple hardware modules are configured or instantiated at different times, communications between such hardware modules may be achieved, for example, through the storage and retrieval of information in memory structures to which the multiple hardware modules have access. For example, one hardware module may perform an operation and store the output of that operation in a memory device to which it is communicatively coupled. A further hardware module may then, at a later time, access the memory device to retrieve and process the stored output. Hardware modules may also initiate communications with input or output devices, and can operate on a resource (e.g., a collection of information).

The various operations of example methods described herein may be performed, at least partially, by one or more processors that are temporarily configured (e.g., by software) or permanently configured to perform the relevant operations. Whether temporarily or permanently configured, such processors may constitute processor-implemented modules that operate to perform one or more operations or functions. The modules referred to herein may, in some example embodiments, comprise processor-implemented modules.

Similarly, the methods described herein may be at least partially processor-implemented. For example, at least some of the operations of a method may be performed by one or processors or processor-implemented hardware modules. The performance of certain of the operations may be distributed among the one or more processors, not only residing within a single machine, but deployed across a number of machines. In some example embodiments, the processor or processors may be located in a single location (e.g., within a home environment, an office environment or as a server farm), while in other embodiments the processors may be distributed across a number of locations.

The one or more processors may also operate to support performance of the relevant operations in a "cloud comput-

ing" environment or as a "software as a service" (SaaS). For example, at least some of the operations may be performed by a group of computers (as examples of machines including processors), these operations being accessible via a network (e.g., the Internet) and via one or more appropriate interfaces (e.g., application program interfaces (APIs).)

The performance of certain of the operations may be distributed among the one or more processors, not only residing within a single machine, but deployed across a number of machines. In some example embodiments, the one or more processors or processor-implemented modules may be located in a single geographic location (e.g., within a home environment, an office environment, or a server farm). In other example embodiments, the one or more processors or processor-implemented modules may be distributed across a number of geographic locations.

Some portions of this specification are presented in terms of algorithms or symbolic representations of operations on data stored as bits or binary digital signals within a machine memory (e.g., a computer memory). These algorithms or symbolic representations are examples of techniques used by those of ordinary skill in the data processing arts to convey the substance of their work to others skilled in the art. As used herein, an "algorithm" is a self-consistent sequence of operations or similar processing leading to a desired result. In this context, algorithms and operations involve physical manipulation of physical quantities. Typically, but not necessarily, such quantities may take the form of electrical, magnetic, or optical signals capable of being stored, accessed, transferred, combined, compared, or otherwise manipulated by a machine. It is convenient at times, principally for reasons of common usage, to refer to such signals using words such as "data," "content," "bits," "values," "elements," "symbols," "characters," "terms," "numbers," "numerals," or the like. These words, however, are merely convenient labels and are to be associated with appropriate physical quantities.

Unless specifically stated otherwise, discussions herein using words such as "identifying," "processing," "computing," "calculating," "determining," "presenting," "displaying," or the like may refer to actions or processes of a machine (e.g., a computer) that manipulates or transforms data represented as physical (e.g., electronic, magnetic, or optical) quantities within one or more memories (e.g., volatile memory, non-volatile memory, or a combination thereof), registers, or other machine components that receive, store, transmit, or display information.

As used herein any reference to "one embodiment" or "an embodiment" means that a particular element, feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. The appearances of the phrase "in one embodiment" in various places in the specification are not necessarily all referring to the same embodiment.

Some embodiments may be described using the expression "coupled" and "connected" along with their derivatives. For example, some embodiments may be described using the term "coupled" to indicate that two or more elements are in direct physical or electrical contact. The term "coupled," however, may also mean that two or more elements are not in direct contact with each other, but yet still co-operate or interact with each other. The embodiments are not limited in this context.

As used herein, the terms "comprises," "comprising," "includes," "including," "has," "having" or any other variation thereof, are intended to cover a non-exclusive inclusion. For example, a process, method, article, or apparatus that comprises a list of elements is not necessarily limited to only

those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. Further, unless expressly stated to the contrary, "or" refers to an inclusive or and not to an exclusive or. For example, a condition A or B is satisfied by any one of the following: A is true (or present) and B is false (or not present), A is false (or not present) and B is true (or present), and both A and B are true (or present).

In addition, use of the "a" or "an" are employed to describe elements and components of the embodiments herein. This is done merely for convenience and to give a general sense of the disclosure. This description should be read to include one or at least one and the singular also includes the plural unless it is obvious that it is meant otherwise.

Upon reading this disclosure, those of skill in the art will appreciate still additional alternative structural and functional designs of integrating an overhead representation with a street view perspective through the disclosed principles herein. Thus, while particular embodiments and applications have been illustrated and described, it is to be understood that the disclosed embodiments are not limited to the precise construction and components disclosed herein. Various modifications, changes and variations, which will be apparent to those skilled in the art, may be made in the arrangement, operation and details of the method and apparatus disclosed herein without departing from the spirit and scope defined in the appended claims.

What is claimed is:

1. A computer implemented method, comprising:

outputting, for display in a first region of a user interface, an overhead representation of an area;

outputting a visual indicator for display on the overhead representation, the visual indicator having a position, a directional orientation, and an appearance;

outputting, for display in a second region of the user interface, a street view perspective of the area, the street view perspective having a point of view that corresponds to the position and directional orientation of the visual indicator and a size of a field of view that corresponds to the appearance of the visual indicator;

identifying a plurality of features within the overhead representation of the area that are also within the street view perspective of the area, each of the plurality of features associated with map data describing a location of the feature and other attribute information of the feature; and

projecting the plurality of identified features onto the overhead representation of the area, wherein the projecting comprises marking the plurality of identified features in the overhead representation in a manner that visually distinguishes the identified features from features within the overhead representation of the area that are not within the street view perspective of the area.

2. The method of claim 1, wherein the visual indicator is an interactive control, the method further comprising:

receiving information about a first user input that adjusts the directional orientation of the interactive control by rotating the interactive control; and

updating the street view perspective to track the directional orientation of the interactive control as the interactive control is rotated.

3. The method of claim 2 further comprising:

receiving information about a second user input that changes the position of the interactive control by dragging the interactive control around the overhead representation of the area; and

updating the street view perspective to track the position of the interactive control as the control is dragged around the overhead representation.

4. The method of claim 1, wherein the visual indicator comprises a cone, and an angular size of the cone corresponds to the size of the field of view.

5. The method of claim 1, wherein the visual indicator is partially transparent.

6. The method of claim 1, wherein the area is an area of a map.

7. The computer implemented method of claim 1, further comprising:

displaying, on the overhead representation, a visual marker indicating a stored location of a feature on the map; and

responsive to the user moving the marker to a new location, updating the stored location of the feature to the new location.

8. The computer implemented method of claim 7, further comprising:

updating the street view perspective to show the new location of the marker.

9. The computer implemented method of claim 1, wherein the other attribute information of the feature describes at least one of: a name, shape, and size of the feature.

10. The computer implemented method of claim 1, wherein the plurality of features comprise at least one of: a road, park, body of water, building, and business.

11. The computer implemented method of claim 1, wherein a feature of the plurality of features is a building and wherein identifying the plurality of features within the overhead representation of the area that are also within the street view perspective of the area comprises:

identifying the building as being within the overhead representation of the area and also within the street view perspective of the area using a previously stored association between an image of the street view perspective of the area and the building.

12. A system comprising:

a processor; and

a non-transitory computer-readable storage medium storing computer code, the code when executed by the processor causes the processor to perform steps comprising:

outputting, for display in a first region of a user interface, an overhead representation of an area;

outputting a visual indicator for display on the overhead representation, the visual indicator having a position, a directional orientation, and an appearance;

outputting, for display in a second region of the user interface, a street view perspective of the area, the street view perspective having a point of view that corresponds to the position and directional orientation of the visual indicator and a size of a field of view that corresponds to the appearance of the visual indicator;

identifying a plurality of features within the overhead representation of the area that are also within the street view perspective of the area, each of the plurality of features associated with map data describing a location of the feature and other attribute information of the feature; and

projecting the plurality of identified features onto the overhead representation of the area, wherein the projecting comprises marking the plurality of identified features in the overhead representation in a manner that visually distinguishes the identified features from

features within the overhead representation of the area that are not within the street view perspective of the area.

13. The system of claim **12**, wherein the visual indicator is an interactive control, the code when executed by the processor causes the processor to perform steps further comprising:

receiving information about a first user input that adjusts the directional orientation of the interactive control by rotating the interactive control; and

updating the street view perspective to track the directional orientation of the interactive control as the interactive control is rotated.

14. The system of claim **13** further comprising code when executed by the processor causes the processor to perform the steps:

receiving information about a second user input that changes the position of the interactive control by dragging the interactive control around the overhead representation of the area; and

updating the street view perspective to track the position of the interactive control as the control is dragged around the overhead representation.

15. The system of claim **13** further comprising code when executed by the processor causes the processor to perform the steps:

receiving information about a second user input that tilts the interactive control; and

updating the street view perspective to track the directional orientation of the interactive control as the interactive control is tilted.

16. The system of claim **12**, wherein the visual indicator comprises a cone, and an angular size of the cone corresponds to the size of the field of view.

17. A computer program product comprising a non-transitory computer-readable storage medium containing executable computer program code for controlling a processor to perform steps comprising:

outputting, for display in a first region of a user interface, an overhead representation of an area;

outputting a visual indicator for display on the overhead representation, the visual indicator having a position, a directional orientation, and an appearance;

outputting, for display in a second region of the user interface, a street view perspective of the area, the street view perspective having a point of view that corresponds to

the position and directional orientation of the visual indicator and a size of a field of view that corresponds to the appearance of the visual indicator;

identifying a plurality of features within the overhead representation of the area that are also within the street view perspective of the area, each of the plurality of features associated with map data describing a location of the feature and other attribute information of the feature; and

projecting the plurality of identified features onto the overhead representation of the area, wherein the projecting comprises marking the plurality of identified features in the overhead representation in a manner that visually distinguishes the identified features from features within the overhead representation of the area that are not within the street view perspective of the area.

18. The computer program product of claim **17** wherein the visual indicator is an interactive control and further comprising program code to perform steps comprising:

receiving information about a first user input that adjusts the directional orientation of the interactive control by rotating the interactive control; and

updating the street view perspective to track the directional orientation of the interactive control as the interactive control is rotated.

19. The computer program product of claim **18** further comprising program code to perform steps comprising:

receiving information about a second user input that changes the position of the interactive control by dragging the interactive control around the overhead representation of the area; and

updating the street view perspective to track the position of the interactive control as the control is dragged around the overhead representation.

20. The computer program product of claim **18** further comprising program code to perform the steps comprising:

receiving information about a second user input that tilts the interactive control; and

updating the street view perspective to track the directional orientation of the interactive control as the interactive control is tilted.

21. The computer program product of claim **17**, wherein the visual indicator comprises a cone, and an angular size of the cone corresponds to the size of the field of view.

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